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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

American Museum of Natural History

MAY 27, 1933

Microscopic Living Jewel

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A SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

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The Weekly Summary of Current Science

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Edited by WATSON DAVIS

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DO YOU KNOW?

The first man to compare the action of the eye to a camera was Leonardo da Vinci.

Bats that live in a subterranean room in the Carlsbad Caverns, New Mexico, came out of hibernation this year six weeks earlier than usual.

Soapless laundries at home and in industry are in prospect, as a result of introducing sulfonate alcohol detergents, or "soapless soaps."

The poet Milton probably owed his eye trouble to near-sightedness complicated with glaucoma, is the verdict of a modern eye specialist.

The idea of producing paper from wood is credited to the French physicist Reaumur, who observed that the nest of the paper wasp is made of wood fiber.

Automobile drivers' tests are being urged for Great Britain, where, it is pointed out, 1,800,000 persons have been injured or killed on the roads in fourteen years.

The entire state of Massachusetts has been photographed in an airplane survey.

The largest lump of ambergris ever known to come from a whale weighed 750 pounds and was taken out by the crew of a Nantucket ship.

The ocean sunfish, sometimes called the headfish because the greater part of its length is taken up by its head, sometimes weighs more than 2,000 pounds.

A new whooping cough vaccine developed at the University of California is said to be more effective than vaccines now in use.

The big spirals of rock popularly called "devil's corkscrews" in Nebraska are thought by some scientists to be the fossil burrows of an extinct kind of rodent.

A woman's job of homemaking takes 51 hours a week, on the average, judging by a survey of 2,000 homes in what is termed the "middle income group."

WITH THE SCIENCES THIS WEEK

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To what volume will 125,000 cubic feet of hydrogen expand in the stratosphere? p. 323.

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Does a baby wiggle most in dim or bright light? p. 324. *The Behavior of the Newborn Infant—K. C. Pratt, A. K. Nelson and Kuo Hua Sun—Ohio State Univ.*, 1930, $3.

What new service is being rendered the unemployed in Minnesota? p. 328.

These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information of the article, but are references for further reading. Books cited can be supplied by Book Dept., Science News Letter, at publishers' prices, prepaid in U. S.

AERONAUTICS

New Ascent Will Try to Pass Heights Reached by Piccard

Lighter Metal Sphere With Larger Gas Bag To Rise Into Stratosphere This Summer at Century of Progress

WITH THE GOAL of floating eleven or more miles above the earth, higher than man has ever gone before, a stratosphere balloon with air-tight man-carrying gondola of special design will rise from Soldiers Field, Chicago, in late June or early July as a part of the science program of the Century of Progress international exhibition.

Within the seven-foot diameter ball hung from the 600,000 cubic foot balloon will be two men, one a pilot and the other a scientist.

Lieut. Comm. T. G. W. Settle, Navy expert who is licensed and qualified to pilot every type of aircraft known, will be in charge of navigating the balloon to its great height.

Prof. Auguste Piccard, the Belgian physicist, whose ten-mile-high balloon ascensions in Europe now are world records will probably be the scientist. If Prof. Piccard cannot make the flight, Prof. A. H. Compton of the University of Chicago will designate one of his colleagues in cosmic ray research to take the stratosphere ride in the interest of science. Measurements of cosmic rays will be one of the main scientific objectives of the ascension.

A magnesium metal alloy, known as dowmetal, will be used in constructing the spherical gondola in which the men and scientific instruments will be housed during the flight. Dowmetal is a third lighter than aluminum. It is the metallurgical creation of the Dow Chemical Company of Michigan, who are now constructing the gondola. This saving in weight, coupled with a balloon that is a fifth larger than the one used by Prof. Piccard on his previous flight, makes the exploration of the eleventh and even twelfth miles above the earth extremely likely. The Piccard flights reached a little over ten miles altitude.

Tentative plans have been made to broadcast the flight, minute by minute, from the stratosphere to a ground radio station from which it would be relayed over one of the national radio chains.

The National Aeronautic Association has given its approval of the ascension and it will provide altitude instruments which will make the height records official for world record acceptance.

Near the top of the atmosphere in the stratosphere the balloon will hold 500,000 cubic feet of gas, which is 100,000 cubic feet more than the previous Piccard balloon. But at the start only about 125,000 cubic feet of very pure hydrogen gas will inflate the giant gas bag, which will have a pear shape due to its inflation to only about one-fifth capacity. As the balloon rises, and most of the atmosphere and its pressure is left behind, the gas will expand tremendously and at the greatest height the balloon will be fully filled.

To obtain the greatest possible lift the Union Carbide and Chemical Company will furnish hydrogen gas of a purity of 99½ per cent. or better. Oxygen carried in tanks and released as needed within the gondola will allow the crew of two to live safely at stratosphere altitudes where there is practically no air. The balloon is being made by builders of the Navy's giant airships, the Goodyear Zeppelin Corporation at Akron, where Commander Settle is at present serving as airship inspector for the Navy.

The take-off will occur at ten or eleven o'clock in the evening, to take advantage of the cool night temperature during the early hours of the flight. As the sun rises the balloon will rise with it, ascending into thinner and thinner air as the heat expands the gas.

The greatest height above the earth should be reached about (*Turn Page*)

ENGINEERING

New Works Preventing Exceptional Flood Damage

IF IT WERE not for the extensive flood-protection works that have been completed during recent years, the present flood situation in this country would be rating as an unusually bad one—perhaps a record, officials of the U. S. Weather Bureau informed Science Service. As it is, the damage is severe, but not exceptional.

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CHEMISTRY

First Chemical Evidence of Artificial Transmutation

CHEMICAL evidence of the production of helium gas from paraffin and similar carbon-hydrogen compounds, by bombardment with the mixed radiation from thorium is adduced by Prof. Fritz Paneth and his associate, P. L. Günther, of the University of Königsberg, Germany, and reported to *Nature*. The rays given off by thorium B and thorium C themselves contain some helium in the form of alpha particles, but after passing through paraffin, there is a surplus of helium amounting sometimes to 100 per cent.

A practical method for the manufacture of helium would be of great commercial value but the method described by Prof. Paneth and his associate cannot as yet be used for this purpose. The amounts they obtained were very small and were detected only by improved methods of analysis.

Nevertheless, their experiments are extremely important because this is the first indication that the transmutation of elements may be effected in amounts large enough to be chemically detectable. Until now, proofs of artificial transmutation depended upon the physical detection of single atomic destructions, observed as scintillations, or by electrical methods. Only when the new atoms formed were expelled with a large amount of energy could the transmutation be detected by these physical methods.

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mid-afternoon when the sun is hottest. Then the descent will be made and the landing should be made in the evening.

The great crowd of spectators which will throng famous Soldiers Field to watch the beginning of the flight will get a thrill as the balloon rises. A few hundred yards to the southeast of the starting point there are the 628 foot towers and cables of the Century of Progress skyride and the balloon will be shot up at about twenty miles per hour in order to clear this hazard.

The exact day of the start will depend upon weather conditions. Where the balloon will land will depend on wind directions and other meteorological factors. Even if the magnesium metal sphere drops into one of the Great Lakes, it and its human and scientific freight will be rescued safely because the air-tight ball will float for hours.

Commander Settle has won many balloon races for the Navy, including the international race in Switzerland last year. He is said to be the only man in the world who is licensed to fly a balloon, an airplane, an airship the size of the U. S. S. Macon and a glider. One of his feats was a descent from the airship Los Angeles in a small glider. He crossed the Atlantic on the Graf Zeppelin as Navy observer. One of his most perilous experiences was a wild balloon ride in 1928 during the national races, when an electrical storm killed two other pilots and jeopardized Commander Settle and other contestants.

The Navy is lending Commander Settle to the Century of Progress exhibition for the stratosphere flight.

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RADIO

MAN: DUST OR DESTINY?

by

Dr. Madison Bentley

—of the Department of Psychology of Cornell University.

Friday, June 2, at 1:45 p.m. Eastern Standard Time over stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

PSYCHOLOGY

Scientists Penetrate Unknown Surrounding Newborn Babies

They Find That Very Young Babies Smell Flower and Other Odors and Know When Light Dims or Brightens

CAN THE BABY just arrived in this world smell the flowers banked in mother's room or the less agreeable odor of disinfectant on the hospital floors.

Yes, he can, it appears from experiments reported to the Midwestern Psychological Association meeting at Ames, Iowa, last week by Dorothy R. Disher of Ohio State University. Her research is still in progress under the direction of Dr. F. C. Dockeray.

Psychologists have been hampered in all attempts to find out exactly how sensitive the newborn is to what is going on about him. The child cannot tell what he sees, hears, smells, or feels. The scientist can find out only by the most indirect means.

Miss Disher gets around this obstacle by making the experiment when the baby is sleeping. She then lets him smell an odor of a definite quality and strength and measures the activity which results. Moving pictures taken at the same time record all the kicks and jerks, puckers of the face, movements of the head, and so on.

No race, sex, or age differences were noticed in this experiment, but it did seem as though the right nostril may be more sensitive than the left. Considerable difference was found between individuals.

Even very young babies from one to ten days old can notice the difference between dim light and moderately bright illumination and demonstrate that fact by a reduction in activity in the stronger light. The newborn is much more keenly aware of his surroundings than has been realized, the psychologists learned from a report of LaBerta Weiss, of the Iowa Child Welfare Research Station.

The ingenious method devised by Miss Weiss for revealing what the baby can see and hear is that of recording the movements of the child. A machine appropriately called a stabilimeter records each little wriggle, squirm, and jerk of the tiny body.

These movements are consistently stronger in the dimmer illuminations, Miss Weiss found, and are reduced in direct proportion to the intensity of the light turned on.

Similar effects resulted from exposing the babies to noises of about the intensity of a vacuum cleaner and of an average motor truck.

These results showed that newborn babies can differentiate between moderate and dim lighting and between comparative silence and moderately loud noise.

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GEOLOGY

Petroleum Said to Come From Garbage of Sea

PETROLEUM, now one of the principal wealths, was originally garbage—offal from the endless complex banquet of the sea, that not even the bacteria in the bottom slime would eat.

This un-pretty picture of the origin of "black gold" comes from a report presented at the meeting of the American Petroleum Institute in Tulsa, Okla., last week by Dr. Parker D. Trask of the U. S. Geological Survey. Dr. Trask and his associates have for a number of years been conducting an exhaustive study of both modern and ancient sea-bottom deposits, seeking for further knowledge of how petroleum was formed in the first place, so that seekers after oil may have a better idea of what kinds of geological formations are likely to yield paying results to their expensive drillings.

They found that fine-grained beds contain more organic matter than coarse-grained: clay more than silt, silt more than sand. They learned, as was to be expected, that where the sea bottom is rolling and irregular, richer deposits are to be found in the hollows than on the submarine hilltops or slopes. They found, above all, that the dead bodies of the myriad sea plants that escaped eating by fish and other marine animals were not left as raw materials

for oil-making until even the bacteria of the bottom slime had taken from them such materials as they wanted.

This bottom bacterial action seems to be of the highest importance in the formation of the stuffs that eventually become petroleum. Crude plant materials, and such fishes and other animal carcasses as settle to the bottom, have relatively high nitrogenous and carbohydrate contents, which are unsuitable for working over into oil. The food requirements of the bacteria seem to be especially aimed at these non-oil-producing food materials, thereby leaving the organic debris in better condition for the oil-making processes themselves.

Oil-making seems to be an exceedingly slow job. It is not going on in the sediments now forming on the ocean bottom, but it is in progress in sediments laid down on the sea bottoms of geological yesterdays. The steps are not known with anything like satisfactory certainty, but there seems to be no doubt that great increase in sedimentary thickness, with resulting pressure and heat, squeeze and fry out the material that eventually becomes petroleum. It then seeps along migration paths through sandy strata, and collects in pools where impervious rock layers bar its further wanderings.

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HOROLOGY

New Inventions Make Possible More Accurate Time Keeping

Watches Regulated in Ten Minutes Instead of Ten Days "Robot" Clock Errs Less Than 1-1000 Second in 24 Hours

TEN MINUTES instead of ten days is the time required by a jeweler to regulate a watch to maximum time-keeping efficiency with the use of a new electric watch timer demonstrated to the Horological Institute.

Accurate time intervals are given by a special electrical current of 100 cycles per second accurate to one part in ten million furnished by telephone companies from a constant frequency generator in New York. This current drives a synchronous motor similar to those that have come into such wide use in electric clocks.

Within the new timer developed by the Bell Telephone Laboratories an image of the watch balance wheel is reflected on a mirror and a flashing lamp controlled by the precise synchronous motor flashes. This makes the watch's balance wheel seem to stand still when the watch and motor have exactly the same speed.

The stroboscopic effect allows the jewelers to inspect and diagnose any trouble in a watch as well as regulate its time-keeping quickly and accurately.

Future time signals from the U. S. Navy's great radio station at Arlington, NAA, will be more frequent, more accurate, and yet require no additions to the Naval Observatory personnel, because of a remarkable new type of crystal-controlled "robot" clock which has been invented by two members of the Naval Research Laboratory. The clock was described before the meeting of the American Geophysical Union, by Paul Sollenberger, astronomer of the Naval Observatory.

Three such clocks have been built. They embody a new principal in crystal control, in that the piece of quartz whose vibrations govern the movement is longer than in former clocks and therefore vibrates at a rate so low as to require no electrical reduction, as is the case in crystal-controlled clocks now in common use. Tests of the new clocks indicate that they will run indefinitely with an accuracy within a thousandth of a second a day.

An automatic mechanism has been developed by Mr. Sollenberger which will attend to the sending of the NAA time signals, performing all its functions without human prompting. In carrying out this automatic program it will start and stop the recording chronograph and turn on the radio receivers. The presence of an operator, however, will be required because the frequencies to which the receivers must be tuned vary from signal to signal. The duties of the human attendant, however, are so much lightened by the "robot" activities of the program device that although a time-signal program may in future be sent twenty times or more in a day, no new men will need to be taken on for this increased work.

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POOR LITTLE MASTODON

This victim of the great Ice Age asphalt trap at Rancho La Brea stands five feet high and measures five feet six inches in length, a size approximately equivalent to that of a five-year-old Indian elephant. The condition of bones indicates that his few years were not entirely untroubled. It is evident that he suffered from curvature of the spine, and one of the limb bones is marked by an exostosis probably resulting from an injury. Two broken ribs which were completely healed indicate an early accident. So far as is known, no specimens of the young of this elephant-like creature have been recorded outside of Rancho La Brea, and this skeleton recently put on exhibit in the Los Angeles Museum is the only mounted specimen of a baby mastodon in exsistence.

BIOLOGY

Crystal Wonderland

Glassworker's Skill Models Three-Dimensional Pictures Of Fantastic Creatures That Live in a Drop of Water

See Front Cover

By DR. FRANK THONE

ROMANCERS of the Verne-Wells school, as well as older-fashioned tellers of fairy-tales, have always delighted in occasional excursions into the world of the very small, showing us through the eyes of a Hop-o'-my-Thumb or a Gulliver the astonishing aspect of things when their scale of size is changed. It is a real adventure, undoubtedly, to see a wine-cask no bigger than a wine-glass, or in another imaginary land to drive a mouse as you would a horse.

But not even Wells, most modern of these literary discoverers of wonderlands, has ever taken us on as exciting a voyage as he could if he only would. Imagination would not be necessary at all; one would only need to take for granted eyes gifted with microscopic vision, and then dive into the first inch of water in the nearest brook or garden pond. In those clear or greenish depths is a world of plants and animals more fantastic, more fascinating, often more ferocious, than you will find in the jungles of the Amazon or the Niger or the Irrawaddy. Here you will find animals rooted like plants; plants that snatch their prey like animals. You will see Edens of Adamless Eves: strange little female animals that have no males among them, yet spawn forth countless swarms of young. You will see other little animals that have no sex at all, swirling down the currents like living stars or jewels in their unimaginable delicacy of lacy structure.

Easy Way For You

You can see all these things through a microscope, as scientists and laymen have been seeing them for many years. But the way into this Lilliputia of the waters is being made even more easy for you, through the amazing artistry in glass of a worker at the American Museum of Natural History in New York. This man, Herman O. Mueller, has been hailed as "the most skillful glassblower in the world." He was once glassblower for Tiffany's as was also his father before him, but the wisdom of the American Museum's administrative officers brought about his capture from the services of a few wealthy patrons and dedicated his unique talents to the more democratic service of the museum-visiting public.

Some recollection of his apprenticeship in this jewelry profession lingers in Mr. Mueller's models of individual specimens of the deep-sea protozoa known as radiolarians. These tiny animals, only one cell in size, belie the adjective "primitive" often applied to them; they are highly complex in spite of their unicellular structure, and in their complexity they attain a beauty of design that not even the sophisticated artists of Renaissance Venice ever dreamed of. They are veritable swimming jewels, and would undoubtedly dictate fashions in gold and platinum if jewelry designers knew about them—and had the skill to imitate their intricate patterns.

Mr. Mueller, at least, can reproduce these patterns, and in a medium which most craftsmen find much harder to handle than the precious metals. But in his hands, glass, the brittle and refractory, becomes plastic and obedient. He has only two principal tools: flame, as manipulated with the blowpipe, and his own breath. With these, and a few odd sticks and rods, he treats glass as though it were wax, cutting and trimming it, bending and moulding it, drawing out points to threadlike fineness or blowing up globose bubbles, welding together pieces of diverse colors to give the soft green of plants, the brilliant patterns of some of the little animalcules whose bodies he renders faithfully in all details but enlarged thousands of times so that our not-so-very-sharp eyes can see and study them.

In doing this work he uses as models preferably the living things whose portraits he is moulding in glass. He has them individually under the microscope, and looks at them from time to time as he manipulates his glass. Sometimes, however, he cannot get the fresh material and must work from the drawings in scientific monographs, as a portrait painter must sometimes work from photographs of a person long since dead. This was the case with the radiolarians, which live in the depths of the ocean, and some of them in remote parts of the world.

These radiolarians are sometimes known as "wheel animalcules," because most of them build many-pointed spiky skeletons out of silica. They are not really wheels, however, but spheres. But the foreshortened view one gets of them from one side makes them look like many-spoked little wheels, and as they go rolling over and over in the gentle currents of water, the wheel-resemblance becomes even more striking. Glass is a most appropriate medium in in which to portray radiolarians, for the transparent silica of which their skeletons are built is one of the chemical constituents of glass; moreover, the living protoplasm that clothes it is itself almost glass-transparent.

Groups Are Masterpieces

Not all the radiolarians are little globular wheels; at least one species that has been modeled by Mr. Mueller has bilateral rather than spherical symmetry, and it is a beauty, too, as its picture on the front cover attests. But most of the tiny animals fit the name.

In spite of the unbelievable beauty of his individual radiolarian models, Mr. Mueller's real masterpieces are the "habitat groups", in which plants and animals appear bearing the same complex relationships to each other that they do in nature. On a group of this sort, often containing models of hundreds of plants and animals, Mr. Mueller will spend literally years of work, just as some of the old Italian masters spent years on a big battle painting.

A notable group in the American Museum, which has been attracting a great deal of attention lately, is called the Rotifer Group, because of the prominence it gives these curious little animals. It is an exact representation of a half-inch patch of pond bottom, with its aquatic plants growing in place and a population of rotifers and other animals engaged in the intense and endlesss game of eating and trying to escape being eaten. Seen still, as though caught by a lightning flash, this hundred-diameter enlargement of a

watery microcosm is tense with drama.

Zigzag through it run the stems of a bladderwort. This is a very common plant, with species all over the world. Above water it bears attractive little yellow flowers on the stems rising a few inches over the surface. Very innocent and attractive it seems—but below water it shows itself for the hungry harpy it really is: an avid and remorseless plant of prey. Scattered on branches of its zigzag underwater stem system are little hollow green globes, with mouth-like openings at the side, guarded with fine green bristles.

These are the plant's traps, with which it catches its prey. They are apparently its stomachs also, for digesting the prey afterwards, for whatever gets into one of those traps never comes out again, but eventually turns into meat for the blatterwort.

These traps are not mere passive lobster-pots, either, into which the prey swims and is unable to swim out again. They are as positive as steel-traps in their action. When a swimming or creeping animalcule touches certain bristles at the mouth of one of them, it suddenly snaps open. Inside, the globe has been empty, and seemingly under some tension; for the water immediately swirls into the opening, sweeping the luckless beastie with it. And that is the end of *him*.

All this, carefully studied out by botanists, is faithfully reproduced in Mr. Mueller's huge-scale models. One of the traps shows through its transparent wall the remains of an unlucky rotifer that has been engulfed.

Each of these traps in the model is basically a large bubble of glass. Over this the artist has fused on a network of green glass threads, to represent the network of veins seen on the natural plant. The bristles are slender glass rods and threads, and the attaching stem is a bit of glass tubing. The main stem is made of larger tubing, cut into lengths and fused together at zigzag angles, faithfully copied from life. Within the outer stem-wall is a second tube, on which has been fused three network layers of green threads, to represent the three layers of green cells found in the natural plant.

Beads For Chlorophyl

Lying athwart the bladderwort stem at one point is a large desmid, a single-celled primitive plant shaped like a half-moon. To make this, Mr. Mueller first moulded two glass cornucopias. Into these he fitted masses of green glass beads lightly fused together over glass cores, to represent the chlorophyl masses of the desmid itself.

Along one side are stems of a leafy waterplant, its spiky leaves reminding one a little of Christmas-tree twigs. Each of these leaves was made by first fusing a green "midrib" along the side of a glass cylinder, and then diagonally slicing out a piece of the glass.

Running through the group are numerous threads of the freshwater alga known as "water silk", or more learnedly as *Spirogyra*. It earns the second name by the beautiful bands of green that spin spirals around all of its cells. These are its chloroplasts, its food-making bodies. *Spirogyra* is alone among plants in having spiral chlorophyl bodies.

Of the various animals shown in the group, the most numerous and prominent are the rotifers. These are small, mostly transparent creatures, more or less replated to worms though they suggest very little of a worm-like nature to the casual observer.

The world is full of rotifers, that is, all the moist parts of it are. You can hardly put a drop of water picked up at random under a microscope without finding some of them in it. They are certain to attract attention, too, because they seem literally to have wheels in their heads. That is how they got their name, which is Latin for "wheel-bearers". They do not really have rotating wheel-like organs, but instead have two circles of exceedingly fine whip-like processes, whose incessant undulating lashings create the illusion of rotation. These "wheels" of flagellae are the animal's swimming oars, and when it is anchored by its other end to something solid they draw the water to it, bearing the "unconsidered trifles" that rotifers feed on.

In Mr. Mueller's group there is one cluster of anchored "colonial" rotifers, growing from a common stem-point like a loose bouquet of fantastic flowers. There are some other rotifers that have anchored themselves to the back of a *Daphnia*, or water-flea, and are stealing a ride—subaquatic hitch-hikers. And there is one large rotifer that is engaged in a most interesting way of getting its food. It is creeping along one of the threads of *Spirogyra*, and each cell it comes to it punctures, sucking out the living contents as a weasel sucks eggs!

So realistically has all this been done that one forgets it is all imitation, all glass. And that, perhaps, is the highest tribute to the consummate skill of Herman Mueller and of the patient old father who helped him.

American Museum of Natural History

IN THE LITTLE JUNGLE OF THE POND

Magnified a hundred times, a fraction of an inch of the vegetation of a pond bottom has been modeled in glass for the American Museum of Natural History. The zigzag stems are those of the carnivorous water plant known as the bladderwort; a number of its hemispherical animal-catching traps are also shown. The straight bamboo-like stems belong to Elodea, and the slender threads, like vines in a jungle, are of the alga Spirogyra. Other algae are shown rooting like epiphytes on the bladderwort stems. The crescent is that of another alga, a desmid. Animals are mostly rotifers—notably the colony of stalked ones near one of the bladderwort traps. A rotating Volvox colony is also shown, in the lower right hand corner.

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PSYCHOLOGY

New Employment Centers Are Adult Guidance Clinics

AN ENTIRELY new type of social institution organized to help adults to make the most of their vocational opportunities, just as the child guidance clinics aid children educationally, was described to the meeting of the Midwestern Psychological Association in Ames, Iowa, last week by Dr. Donald G. Paterson of the University of Minnesota.

This new type of employment center is the outgrowth of work now being done toward employment stabilization in the cities of Minnesota and also at Rochester, N. Y., and Philadelphia, Pa.

"Intensive study of unemployed individuals has revealed the urgent need of assisting unemployed persons in planning ways and means of becoming economically self-supporting," Dr. Paterson declared.

"Every person studied represents a story of human interest which reveals far too often that the hazard of unemployment, when it actually strikes a given individual, creates as much havoc as does disease. Just as society provides doctors of medicine to aid in physical crises, so there is urgent need for society to provide doctors of vocational adjustment."

The employment centers of Minnesota, newly reorganized on these modern lines, are today rendering an important service to the community, to industries, and to thousands of unemployed persons, Dr. Paterson said. During 1932, despite the depression, over 27,000 unemployed persons were placed in positions for which they seemed to be fitted.

Science News Letter, May 27, 1933

GEOLOGY

Princeton's Annual Train To Make Geology Tour

THE ANNUAL travelling geology class will set forth on its private Pullman car, "Princeton," on June 21 for a journey across the continent and a view of the record of the rocks from the earliest eras of time to the present.

For the past eight years the International Summer School of Geology and Natural Resources under the direction of Dr. Richard M. Field, Princeton geologist, has conducted an educational geological train-tour with a specially built car as living quarters and classroom for the students and professional geologists who use this method to acquire a closer acquaintance with rocks and strata. The tour is open to men from all colleges and universities.

This year Prof. Erling Dorf, assisted by Dr. Jerome Smiser, will be in charge of the trip and engineers and geologists at the various locations visited will serve as field leaders.

An eleven-day pack horse expedition in the Beartooth Mountains of Montana and Wyoming will give the party the experience of a typical reconnaissance geological survey. The Chicago Century of Progress will be visited.

Science News Letter, May 27, 1933

PHYSICS

Material Particles Scatter Each Other Like Light

IF YOU ARE in a hurry you can't be too particular about energy.

This is a version of the so-called uncertainty principle, which Prof. Niels Bohr of the University of Copenhagen impressed upon California physicists gathered in Pasadena.

When one body shoots by another and transfers energy to it, one cannot inquire too closely as to whether the principle of conservation of energy has been violated, because it takes time to measure energy exactly. This fact helps clarify certain difficulties which old-fashioned physicists worried about.

Prof. Bohr's main purpose is to get scientists to stop worrying about questions which have no possible solution. In return for this sacrifice of vain curiosity, he points out that paradoxes which have been proposed by Einstein and others dissolve themselves.

The Danish scientist is a master of simplification, and presents in brief and elementary form proofs which others achieve only after complicated mathematical developments.

He showed in a few lines how material particles scatter each other according to the same law as that deduced for light by Lord Rayleigh when he explained why the sky is blue. In the optical case the blue light is more easily scattered than the red. Blue photons are heavier, so that here is a case where heavier bodies are pushed aside more easily than light ones. The same curious fact is shown when neutrons scatter protons a million times more frequently than the much lighter electrons.

Science News Letter, May 27, 1933

IN SCIE

AERONAUTICS

Ingenious Device Measures Air Currents Around Macon

THE GIANT airship Macon is not going to meet with any such disaster as that which overtook her sister ship the Akron, if meteorological science has anything to say about it. On the Macon's third trial trip on Monday, May 15, measurements of the air currents around her stern, for pitch, yaw and velocity, were taken with a specially designed instrument known as the hot-wire anemometer, by F. D. Knobloch, a Guggenheim Foundation research worker. These are intended for use in figuring the stresses to which the great ship is subjected.

The hot-wire anemometer measures the velocity of air currents in a most ingenious fashion. It depends simply on the cooling effect of the wind blowing over a wire heated by electricity. The more wind the greater the cooling effect. The changes in the temperature of the wire are electrically registered, and the temperature changes are converted into feet per second of air movement by mathematical calculations.

Science News Letter, May 27, 1933

METEOROLOGY

Temperature Varies Little 3000 Feet Above Ground

THE WIDE daily variations in air temperature near the ground iron out to nearly nothing up where the airplanes soar, J. C. Ballard of the U. S. Weather Bureau told the American Meteorological Society.

He has made a rather extensive study of temperature fluctuations in the upper air, at heights between 3000 and 4000 feet, by means of thermometers sent aloft on kites. The studies were made at six stations in the United States.

He found that the daily temperature variations decreased from ground level until somewhere near the 3300 foot level, after which the daily variations amounted to less than one degree Centigrade (1.8 degrees Fahrenheit).

Science News Letter, May 27, 1933

EE FIELDS

ASTRONOMY

Earth Appears As Blue Planet From Moon

IF WE COULD see the earth from a distance out in the heavens it would appear as a bluish planet, Prof. V. M. Slipher of Lowell Observatory, Flagstaff, Ariz., declared in the George Darwin lecture before the Royal Astronomical Society.

The gold medal of this leading astronomical organization was presented to Prof. Slipher in the presence of a distinguished scientific audience that included Dr. Willem de Sitter, Sir Arthur Eddington and Sir James Jeans. Prof. F. J. M. Stratton, president, made the presentation.

The blueness of the earth was determined by Prof. Slipher from spectrograms made photographically of the earthshine on the moon. Light from the earth was reflected by the moon back to Prof. Slipher's delicate instruments.

Pluto, the most recent of the planets to be discovered which was found at Lowell Observatory, is a reddish planet which is brighter to the eye than it is on a photographic plate.

Science News Letter, May 27, 1933

PHYSICS

Behavior of Neutrons Explained At Conference

THE NEUTRON is a decent fellow. He joins protons together against their nature into atomic nuclei.

He passes through steel or lead with hardly any disturbance.

Once you understand his nature you see clearly why he behaves as he does.

How an electron joins a proton to form a neutron no one knows, but once the two get together they form a compact pair obeying the laws of Newtonian mechanics. Dr. Charles C. Lauritsen of the California Institute of Technology discussed experiments on the neutron, and told of his work on the artificial production of neutrons with artificial alpha rays from helium gas. With his collaborators, H. R. Crane and Dr. Andrew Soltan, he has produced alpha rays of 900,000 volts energy. The results so far are most promising.

During the discussion, Dr. R. M. Langer of the California Institute of Technology pointed out that recent claims of excessive energy for neutrons were not well founded. Prof. Niels Bohr of the University of Copenhagen explained why neutrons, contrary to expectation, bumped protons into motion but did not molest electrons. The reasoning simply depended on the fact that the proton has the same momentum as a neutron when moving with the same speed, while the electron has less.

Hit a fellow your own size, is the key to the neutron's conduct.

Science News Letter, May 27, 1933

MEDICINE

Strange Fever May Last Eleven Years

A MYSTERIOUS fever that may last as long as eleven years has been studied at the Mayo Clinic, Dr. Leonard C. Rowntree of that institution reported at the meeting of the Association of American Physicians.

In spite of careful studies at this and other institutions, no cause has yet been found for the fever. Between 1919 and 1930 this condition was studied in one hundred patients over fifteen years of age. All the patients had had the fever for one month or more, the average being a year and a half, and the longest eleven years.

Most of the patients looked astoundingly healthy, though all of them had to stay in bed, Dr. Rowntree observed. Only six of them looked definitely sick. Most of them were very thin, and all of them felt nervous, tired and weak.

In about three-fourths of the cases, the fever comes on in the late afternoon or early evening, and varies between 99 and 100 degrees Fahrenheit. There were no chills. This disease also is predominantly an ailment of women. There were only twenty-eight men in the hundred Mayo Clinic cases.

A few more than half of the patients recovered from this ailment, although it took twenty-eight months for the fever to clear up.

Dr. Rowntree urged fellow-physicians to make further careful studies of this fever, to determine whether it is an entirely new ailment, or is due to some infection, to nervous condition, or to faulty use of food by the body.

Science News Letter, May 27, 1933

ENDOCRINOLOGY

Alice-In-Wonderland-Like Disease Caused by Tumor

AN ALICE-in-Wonderland-like disease which caused a little girl of three years to become, almost overnight, as grown-up as a thirteen-year-old Miss, was described by Dr. Emil Novak of the Johns Hopkins Medical School at the opening session of the Congress of American Physicians and Surgeons in Washington.

Like Alice, this little girl was able to go back to her own age. The transformation in her case was performed by a surgeon's knife which removed a tumor from her body.

The tumor in this and similar cases, Dr. Novak explained, developed from cells thought to be left over from the formation of the sex glands. These cells in the tumors retain their function of producing the female sex hormone. The excess of this hormone forces the little girl suddenly to grow up. When the tumor is removed and there is no longer an excess of the hormone, she is able to return to her normal age and state of development.

Dr. Novak described several such cases, and also pointed out that similar premature growing-up may be caused by disturbances of other of the body's glands, among them the pituitary and the adrenal glands.

Science News Letter, May 27, 1933

PHYSICS

New Ultra-Centrifuge Has Double Cushion of Air

A NEW DEVELOPMENT in the ultra-centrifuge, an instrument that can whirl at speeds as high at 500,000 a second, has been brought out by Prof. J. W. Beams of the physics department of the University of Virginia. Earlier models consisted of a top-shaped metal rotor with slanting vanes on its under side, against which air-jets were forced to drive it into rapid rotation. This model had the disadvantage of occasionally flying out of its place.

In his new model Prof. Beams uses a disk supported between two cone-shaped pieces of metal, with air-jets directed against it from the top as well as from beneath. This makes for steadier running, and keeps the rotor in place.

Science News Letter, May 27, 1933

ENGINEERING

Reinforced Concrete

"A Classic Invention"

Do You Know That Common Reinforced Concrete Was Once a Patented Monopoly For Sole Use of Its Inventor?

IMPROVEMENT IN COMPOSITION FLOORS, ROOFS, PAVEMENTS, &c. Thaddeus Hyatt, of New York, N. Y. Specification forming part of Letters Patent No. 206,112, dated July 16, 1878. U. S. Patent Office.

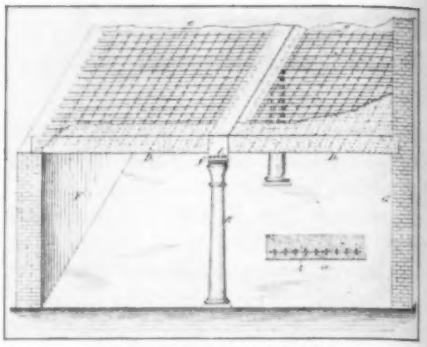
BE IT KNOWN that I, Thaddeus Hyatt, of No. 25 Waverly Place, in the city of New York, county and State of New York, a citizen of the United States, have invented certain new and useful improvements in the use and application of hydraulic cements and concretes, in combination with metal, as a building material and in building constructions made therefrom, and in means, modes, and processes connected therewith, the same being in part applicable to pavements and other walking and load-bearing surfaces and structures.

The general purport of my invention is set forth in a volume entitled "An Account of Some Experiments with Portland Cement Concrete, Combined with Iron, as a Building Material," &c., a copy of which book has been presented by me to the Patent Office Library.

That iron or steel may be combined with concrete or with bricks as tie-metal, capable of furnishing all the tensile strength needed to balance the compressive resistance of the other materials when the beam or structure is subjected to bending-stress, that all metal may be dispensed with save the tie only, and that both baked bricks and concrete possess in themselves cohesive power and strength sufficient to perform the functions ordinarily performed by a metallic web, are the discoveries made by me through many experiments and years of study, upon which I now base my application for a patent.

In applying my invention to the construction of floors and other walking-surfaces and low-bearing structures, and to roofs, to the making of beams, joists, girders, and supports, and to the making of pavement-slabs not liable to crack from their own weight by the giving way of imperfect foundations underneath them, and to the construction of "roof-pavement," for extending the basements of buildings under the footways of public streets, my improvement consists in the use and aplication of iron or steel as tie-metal, combined with the concrete or bricks, to give tensile power to the same; my invention, with respect to the tie-metals, consisting in so preparing or making them as to prevent the possibility of any sliding or slipping of the materials one over the other when the beam or structure is under strain.

For resisting "thrust," as, for example, in the "bow-string girder," a tie may be made dependent upon the two end fastenings only; but a beam proper must be qualified to resist cross-strains, and equally well at any part. The tie must of necessity, therefore, be attached to the web practically throughout its entire length, and as firmly at one point as at another, the object of such fastenings not being to prevent the tie from bursting out or breaking away from the web in a downward direction, because no such tendencies exist, but to counteract the tendency of the tie to slide or slip because of the force of the shearing strains got up in the beam when under bending-stress; this discovery of the true relations existing between a tie and its web also demonstrating the sufficiency of the cohesive power of the web itself to hold the tie to the top of the beam, whether such web be concrete or metal, the difference of thickness necessary for this purpose, where the web is concrete instead of being metal, being proportionate to the difference between the cohesive strength or power of metal and concrete. Basing my improvements in the ties and the manner of connecting them with the concrete upon the theory above set forth as to shearing strains, I find it important to make use of ties having the greatest friction surface. Flat thin ties are, hence, preferable to other shapes. To prevent slipping, these ties require also a roughened surface. This roughened or non-slipping surface may be made in many ways. For some purposes a mere sanded, tarred surface may possibly suffice; but I prefer to use metal specially rolled for the purpose, with bosses or raised portions formed upon the flat faces of the metal. . . .



MORE HEAD ROOM

—in the apartment below. Hyatt's patent drawing showing how the top of the supporting girder may be level with the floor it supports.

With respect to the concrete, my invention deals with it either as a plastic material, to be applied to the tie-metals at the place or upon the ground where the construction is required, or as a moulded and hardened beam ready for use, and to sustain loads as soon as laid in position, or in the form of tiles or bricks, ready for combination with the ties at the place where the construction is to be made. . . .

Another part of my invention consists in making roofs and walking-surfaces of equal bearing-strength in every part, by means of tie-metals or tensile strength distributed equally throughout the construction, thus making the structure beam all over. By this mode of construction I employ the metal in distributed form, instead of employing it in concentrated or beam form. The putting of metal in the form of beams is such a concentration of power or strength upon or within a single line as to make necessary very considerable spaces between the beams, the result of this being to load the beams with the weight of the materials used to fill the spaces. Nevertheless, the employment

of the metal in tie form is no obstacle to the construction of roofs and floors on the beam principle of concentrated metal, a part of my invention consisting in the making of segmental-arch floors by the use of brick beams combined with the arches. Where bricks are employed in combination with concentrated ties to form brick beams, as for example in the segmental-arch construction, a part of my invention consists in forming them with recesses or pockets to receive the ties, and with serrated, corrugated, or roughened surfaces to interlock with one another and give this additional security to the beam-structure during the period required for the hardening of the cement in the joints. . . .

The constructions thus far illustrated and described refer to buildings of ordinary size; but where the spans are great, as in mills and warehouses, the manner of constructing the beams admits of considerable variation, for they are needed, in part, under these circumstances to be fashioned as girders or short bridges, in order to carry a portion of the flooring in place of a wall. As commonly made of naked metal, such structures are liable to be injured by rust, and the bolts in some cases to be loosened by vibration.

My improvement in structures of this kind consists in protecting the metal by a complete incasement of hydraulic cement or concrete, the effect of which is to both protect the metal from rust and add additional security to every bolt in the structure, the grouting of the hydraulic-cement concrete filling every interstice of the metal portions, and thus producing a perfect union and solidity down to the smallest rivet or pin, making it impossible for any of the parts to work loose. This incasement may bear such relation to the metallic parts as to be a mere shield for the purposes mentioned; or the concrete may be so proportioned to the metal as to become a portion of the mechanical construction of the structure; whether girder or bridge, with reference to comprehessive strains. . . .

In ordinary house-construction it is a common practice to carry the front and rear walls upon girders, the cost of these girders adding materially to the expense of such walls; whereas, by adopting my method of construction, the portion of floor in contact with and underneath the wall may be regarded as a part of it, the metal ties in such portions of the floor serving as tie-metals to the wall itself, converting thus the wall itself into a girder. . . .

Again, it is the practice in common warehouse-building to break the span by a row of columns topped by a girder, to carry the floor in conjunction with the side walls, the whole depth of such girder being seen underneath the floor, and to this extent at that line lessening the head-room of the apartment underneath; but by my method of construction the girder and the floor become one, the girder not being underneath the floor, but a portion of it, and thus, to a large extent, lost to view in it. The consequence of this of course is to give increased head-room to the apartment below, besides improving the appearance of the overhead construction. . . .

In the practical construction of concrete and brick beams with tie-metals, as described, I have discovered by my experiments that these beams may be so made as to either break short, like a cast-iron beam, or give way by first bending, like a wrought-iron beam, the difference resulting from the proportion of tensile strength put into the beam—that is to say, where enough metal is used to make the beam strongest at the bottom.

By this mode of construction all danger of sudden collapse of the structure is avoided, such a floor, like one of timber, giving warning in advance of the final catastrophe. A part of my invention consists, therefore, in making the aforesaid floor, roof, and walking-surface constructions of concrete, or bricks and tie-metals, so proportioned, the one to the other, as to produce relatively the greatest strength at the bottom of the construction, the ties being stronger than the portion of the structure which resists compression. . . .

Science News Letter, May 27, 1933

MARINE BIOLOGY

Thousands of Animals Used Sponge As House

HUMAN BEINGS who live parasitically are often accused of "sponging," but in the warm waters where sponges grow these soft, inert masses of living tissue are themselves very much sponged upon. The extent to which other sea animals exploit sponges for lodging, and often for meals as well, is strikingly set forth in a recent study conducted for the Carnegie Institution of Washington by Prof. A. S. Pearse of Duke University.

Prof. Pearse removed an enormous sponge, as big as a washtub, from the waters near the Tortugas Laboratory of the Carnegie Institution, out beyond Key West in the Gulf of Mexico. He cut it up into thin sections, as one would slice a loaf of bread. Each slice was carefully examined for animals that might be lurking in it, and all these small uninvited lodgers were counted and identified. The total number of individuals was 17,128, approximately two animals for every cubic inch of the sponge's great bulk.

Highest in zoological rank were five little inch-long fishes, very slenderly built so that they could get about in the sponge canals. There were many worms and a number of barnacles. Most numerous, however, were shrimp of a strange species with one claw much larger than the other—in some specimens, almost as large as its body. There were 16,352 specimens of these shrimp.

A different kind of exploitation of growing sponge for protection is described by Dr. W. H. Longley, in charge of the laboratory at Tortugas. A crab that lives in the waters there tears off bits of living sponge and holds them to its shell until they take hold and continue their growth. Thereafter the crab has the benefit of concealment, enhanced by the inedibility of the sponge, which is full of disagreeable prickles and in addition has a most noxious odor.

Another crab which uses living animals as weapons is also described by Dr. Longley. This crustacean, which is an inhabitant of coral reefs in the Pacific, removes sea anemones from the rocks on which they naturally grow and sets them on its own claws. When threatened by an enemy, the crab shoves these claws with their living weapons in his face. The sea anemones as well as the crab may be regarded as gainers by this strange partnership, because they probably get more food by being moved about than they would if they were anchored to a stationary base like a rock.

Science News Letter, May 27, 1933

PHYSICS

Positive and Negative Electrons Apparently Produced in Pairs

By DR. R. M. LANGER, California Institute of Technology

PAIRS OF ELECTRONS, one positive and one negative, are sometimes produced when gamma rays from the element thorium pass through matter. This was reported by Dr. Carl D. Anderson of the California Institute of Technology, Pasadena, as a support of Dr. R. A. Millikan's contention that cosmic rays are originally mostly photons, or "bits of light," like gamma rays. Dr. Anderson has observed that among the energetic cosmic ray electrons there are about as many positive as negative electrons, as if they were produced in pairs.

Dr. Niels Bohr, the great Danish physicist now in Pasadena, said that after listening to the evidence it was scarcely possible to doubt the reality of the positron. He is the particular authority for modern theoretical physicists, yet he gave them something of a shock when he said that although theory had predicted the positron few theoretical physicists would have dared emphasize that before experiment had brought it out.

The basis for our belief in the positron is therefore almost entirely an experimental one.

Dr. Bohr began a series of lectures on the foundations of atomic mechanics. He began with a careful discussion of the famous uncertainty principle, which has in recent years received unhappy treatment. He explained how the act of observation disturbs an electron or atom so that we must remain uncertain as to what its behavior would have been had we not observed it. If we give up the idea of trying to find what it would have done we save ourselves a great deal of worry and see the problem more rationally. Paradoxes then all disappear and atomic mechanics can describe all phenomena, provided we do not inquire about the atomic constitution of our measuring apparatus.

When, however, we examine too closely we get into trouble with relativity. Physicists are stumped at this point and need further experiments to help them out.

Science News Letter, May 27, 1933

METALLURGY

New Discovery Shows How Films Hold Fast to Metals

BETTER protection for metal surfaces against rust and corrosion may be one of the practical results of an important discovery in pure science just reported to the Royal Society by two British physicists, Prof. G. Finch and Dr. Quarrell of Imperial College.

Their discovery has to do with the way thin films of atoms or molecules arrange themselves when they are deposited on the surface of other metals by the special electrical method known as "sputtering." They found that the atoms in such films arranged themselves in the shapes of the metallic crystals underlying them, and not in the crystal shapes proper to their own natural makeup. Thus alumimum deposited on platinum assumed the dimensions of the platinum crystals so far as length and breadth were concerned, though the aggregations of atoms kept the greater height characteristic of aluminum. In this case the aluminum actually became denser than normal, because in two of its dimensions it had patterned itself upon the denser metal, platinum.

A deposit of zinc oxide upon zinc again crowded its crystals to fit them to the dimensions of the smaller zinc crystals. However, in this case the zinc oxide crystals grew taller than normal, so that their total volume remained unchanged.

The significance of the shaping of the deposited substance's crystals to fit the shapes of the underlying metal lies in the fact that there must exist between the crystals of the deposit and those of the substratum a special union or bond that will hold very firmly against any disruptive force. The deposited film is no mere loose layer laid over the surface, but is gripped by every atom in it.

The influence of the underlying metal extends for some little distance upwards, the Imperial College physicists discovered. The crystal shapes of the underlying metal were preserved through a deposited layer as much as fifty atoms thick, their X-ray photographs showed. They are continuing their studies of the physical properties of the films they have already deposited, and are making new films for further research.

Science News Letter, May 27, 1933

In recent experiments, it was found that peas on diseased vines grow more rapidly than peas on healthy vines.

The Department of Agriculture says that industry could use up a million more bales of cotton than it now takes, by wider use of cotton in bags and bagging.

In ironing different fabrics, a home economics specialist advises that linen withstands more heat than most fabrics, cotton takes less ironing heat, wool still less, then silk, and then synthetics.

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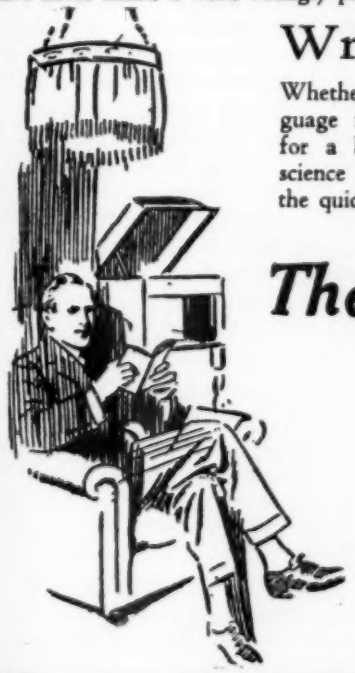

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PLANT PHYSIOLOGY

Fungi, Thriving on Arsenic, Make Gases That Kill Men

FUNGI have appetites that put to shame that of the traditional billy-goat. They thrive on things that are rank poison to other plants and to animals. The astonishing appetites of some fungi for compounds of arsenic have furnished the latest problem for research by two mycologists of the U. S. Department of Agriculture, Dr. Charles Thom and Kenneth B. Raper.

Inspiration for the research was furnished by the occurrence of two deaths in Great Britain, apparently due to the action of these molds on arsenic-containing walls. The need for tangible information about these organisms as they occur in America was evident. Existing literature, considerable in amount but scattered, and some of it inconclusive, runs back through the past century or more. Eventually it was found that these fungi fed upon arsenic-impregnated wallpaper and other things, giving off poisonous gases that made human beings sick and even caused some deaths.

Dr. Thom and Mr. Raper cultivated the accused species of fungi, as well as some others not before suspected, upon nutrient media containing arsenic. From several of their cultures they obtained arsenical gases abundantly. Some other fungi grew on the arsenic-containing nutrients but did not produce any poison gases, these the experimenters designated as "arsenic-tolerant." Some fungi failed to grow. As a result of the study it is recommended that compounds of arsenic should not be used as preservatives for materials to be kept in enclosed spaces, where the gases generated might do harm.

This research helps answer the question why arsenic sprays and dusts can be so widely used against insects without general poisoning of the soil. "Arsenic" fungi were found abundantly in the soils examined and appear to be active enough to aid in disposing of the arsenic commonly applied. In special cases, however, damage to crops is known to occur under conditions where large applications of arsenic fall upon soils of special composition. These are still under investigation.

Science News Letter, May 27, 1933

MINING

Saw Replaces Explosives In Coal Mining

COAL is now being mined with a saw instead of being broken loose with explosives. The development of the coal saw to its present highly practical state has improved quality and value of coal, C. D. McLaughlin, superintendent of the Pioneer Coal Company, told the American Mining Congress.

It has also improved working conditions and safety in mines without any change in organization and supervision, and without displacement of labor. Large lump coal that stands handling and transportation well results from saw mining.

Science News Letter, May 27, 1933

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NATURE RAMBLINGS by Frank Thone

ECOLOGY

Too-Dominant Parents

MOST TREES cast too dense a shade for their own seedlings.

In a well-grown forest of pine, for instance, you will find no little pine trees; in a closed stand of oak no young oaks. You will find the young stages of such trees as these associating with their elders only where accident or the lie of the land lets patches of sunlight down to the forest floor.

For many trees are not at all shade-tolerant, and these include especially the trees that are most apt to come first to a new area of treeless land, either after a fire, or when a stretch of lake bottom, for some cause or other, becomes dry land.

In an area like that of northern Indiana or southern Michigan, where once the most magnificent hardwood forests of this continent grew, the first trees to established a consistent and cohesive forest stand are usually jack pines. These have the double advantage of flying seeds, making their distribution and colonization easy, and of quite modest requirements in the matter of soil fertility, so that they will accept life where other tree species decline to take the chance, or fail to make a go of it if they do start.

But jack pines are trees of the sunlight, requiring full illumination from infancy onward. So when the first generation of trees has taken full possession of the land and stand with their arms locked to defend their ownership, there is not enough sunlight among their trunks for any little pines.

This is what gives trees of another kind their chance. Oaks can tolerate at least a certain amount of shade when they are young, so that under jack pines

in the southern Great Lakes region, you will most likely find little oaks. The second generation of trees, therefore, will be oaks and not pines.

However, oaks play the same selfish game toward their own offspring that the pines played in their day. Oak seedlings need more sun than can be found in the shelter of oak branches. So again we find the children of strangers coming in.

This time they are a mixed people: a good many beechlings, even more little maples, and a smaller but still goodly number of hemlocks. These three species can stand a great deal of shade in their infancy. They take full possession of the oak undergrowth, and when the oak generation dies out they inherit that portion of the earth.

But here the cycle of parental overdominance ends. For the shade of the grown beech-maple-hemlock forest is not too dense for young trees of its own kind. Once a forest has developed to this "climax" stage it remains there forever, replacing itself generation after generation, unless fire or the devastating ax of the human invader intervenes.

Science News Letter, May 27, 1933

SPECTROSCOPY

New Spectra Are Explored By German

SPECTRA lying between the X-rays and the ultra-violet rays of 1200 Angstrom units, in which absorption spectra have hitherto been unknown, have been found by Dr. H. Beutler, Berlin physicist. The elements giving the newly discovered spectra are rubidium, caesium, cadmium and mercury.

Helium was exposed to a condensed discharge to produce light from 900 to 600 Angstrom units. The light source and the test vapor could not be separated from the vacuum spectrograph used by a window or other device because no material known allows these rays to pass through.

The new lines cannot be observed in emission but only in absorption. They are interpreted as arising from a change in the quantum numbers of an inner electron while the valence electrons remain unexcited and they thus represent a transition from optical to Roentgen spectra.

The experiments by Dr. Beutler are considered to be of fundamental importance in spectroscopy.

Science News Letter, May 27, 1933

OCEANOGRAPHY-SEISMOLOGY

Prediction of Tidal Wave Forestalls Harbor Damage

A TIDAL WAVE that traveled on schedule was reported by E. P. Leavitt, Superintendent of the Hawaii National Park, following a recent earthquake in Japan.

The schedule was arranged by earthquake experts after the earthquake itself was registered on the seismographs at the Kilauea Volcano Observatory in the Hawaii National Park, and also at Hilo and Kona, about ten minutes after it occurred in Japan. The Kilauea Observatory is operated under the supervision of Dr. T. A. Jaggar, head of the Hawaiian Volcano Research Association.

Seismologists A. E. Jones at the Kilauea Observatory, and R. V. Woods at Kona, immediately realized that a tidal wave might occur in the Pacific, and figured that such a water wave, traveling 450 miles an hour, would reach Hawaii about eight and one half hours after the earthquake.

Mr. Jones therefore notified the harbormaster at Hilo to look out for a wave about 3:30 p. m. that day, while Captain Woods in Kona informed officials at other ports that the tidal wave would reach them about nine hours after 7 a. m. The earthquake in Japan had occurred about 7 a. m, Hawaiian time.

With this information available, all of the Japanese sampans or fishing boats in the harbor at Hilo were moved out into the ocean to prevent wreckage in case of a large wave.

Intrigued by Mr. Jones' prediction, large crowds gathered at the seashore in Hilo as the hour of 3:30 approached. Mr. Leavitt reports that he and Mr. Jones, with policemen, patrolling cars and inspectors, went to the vicinity of the Wailoa River fish market to get a good view of the expected tidal wave as it came from the ocean. The wave struck within six minutes of the time estimated, and for about two hours rushed in and out through the Wailoa River. No damage was done at Hilo.

On the Kona side of the island, however, there was a maximum wave of about seventeen feet. A boat house belonging to Dr. Jaggar was moved about six feet by the waves and the water tank also was moved. Stone walls in the vicinity were washed out and shipping pens damaged. Here sampans, a motorboat, and several canoes were washed ashore.

Those watching the recession saw the water drop below tide level, revealing the barrier reefs and the red rocks beneath. Neighbors walked around picking up fish in the yards along the beach.

Superintendent Leavitt states that because of the warning given by Dr. Jaggar and his staff, all sections of the Territory were prepared for the tidal wave and so little damage was done. Had it not been for the scientific research investigations carried on by the Hawaiian Volcano Research Association, with the cooperation of the United States Geological Survey, serious damage might have occurred.

Science News Letter, May 27, 1933

Nicotine gets its name from Jean Nicot, who introduced tobacco into France.

A rattlesnake gets a new ring on its rattle whenever it sheds its skin, and that happens several times a year, depending on how well the snake feeds.

Placing a chemically-treated band of paper around an apple tree may bring death to as many as a thousand codling moth caterpillars.

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•First Glances at New Books

Science

AMERICAN MEN OF SCIENCE—Edited by J. McKeen Cattell and Jaques Cattell—*Science Press,* 1278 p., $12. This five star edition of who's who of American science contains more than five times as many biographical sketches as the first edition published in 1906. Referring to this increase to 22,000 biographical entries, the editors say: "This great increase in the number of scientific workers in America represents the enlarged place of scientific research in the modern world and the greater share taken by the United States." Continuing the practice of past editions, those who are judged by their colleagues to have attained a position among our thousand leading scientific men are marked with a star. There are two hundred and fifty men so starred in this edition for the first time. Dr. Cattell prints as an appendix in this edition the complete list of the thousand leading men of science in 1903, given in the order of merit for each science, together with other material concerning the distribution of American men of science. This reference book is, of course, indispensable upon any reference shelf that pretends to deal with current American science.

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Horticulture

HOW PLANTS GET THEIR NAMES—L. H. Bailey—*Macmillan,* 209 p., $2.25. A pleasantly written popular account of the derivation of the names of horticultural plants, by the Nestor of American horticulture. Two exceedingly useful lists are appended, one of generic, the second of specific names.

Science News Letter, May 27, 1933

Ornithology

MY BIRD BOARDERS—Frank Bond—*Green Lamp League, Washington, D. C.,* 104 p., $1.50. A personal account of a "bird cafeteria" conducted for many years by the author. Some of the customers have been most interesting people.

Science News Letter, May 27, 1933

Entomology

JUNGLE BEES AND WASPS OF BARRO COLORADO ISLAND—Phil Rau—*Author, Kirkwood, Mo.,* 324 p., $2.75. The inspiration that resulted in the setting aside of Barro Colorado Island in Gatun Lake as a wild life sanctuary makes us all debtors, for it has fruited in the rapid increase of our intimate knowledge of all manner of fascinating tropical life. In this book a well-known naturalist pries into the intimate affairs of a number of insects of two familiar-enough groups, some of whose ways, however, are clean outside the dreams of our entomological philosophy.

Science News Letter, May 27, 1933

Anthropology

PRIMITIVE ARTS AND CRAFTS—R. U. Sayce—*Cambridge Univ. Press,* 291 p., $2. If we are ever to get a right understanding of human culture as a whole, says the author, we cannot afford to neglect any aspect of it. In this book, accordingly, he discusses the anthropological significance of arts and inventions. The student launching into anthropological work, or the general reader who is seriously interested in man's cultural evolution will find this a profitable text.

Science News Letter, May 27, 1933

Mathematics—Philosophy

LINGUISTIC ANALYSIS OF MATHEMATICS—Arthur F. Bentley—*Principia Press,* 315 p., $3. An endeavor to build up a language for mathematics which will be as consistent as mathematics is consistent with itself. An admirable exercise for the philosophical mathematician, but obviously not for the general reader.

Science News Letter, May 27, 1933

Forestry-Conservation

FOREST BANKRUPTCY IN AMERICA—George P. Ahern — *Green Lamp League, Washington, D. C.,* 319 p., $2. A state-by-state survey of how we have wasted our forest birthright, with warning of consequences to be expected.

Science News Letter, May 27, 1933

Horticulture

THE ROCK GARDEN—C. P. Halligan —*Mich. Agr. Exp. Sta.,* 83 p., free. An unusually well gotten up bulletin, which tells more about what to do and what to avoid in rock gardening than many a more pretentious book.

Science News Letter, May 27, 1933

Psychology

THE ENERGIES OF MEN—William McDougall—*Scribner's,* 395 p., $2. In this book the famous author attempts to combine in one moderate-sized volume the most essential material from his "Outline of Psychology" and "Outline of Abnormal Psychology." Of it he says, "I had conceived the composition of this book as largely work with scissors and paste. But I soon found that my views had developed, in respect, as it seemed to me, of clarity and depth of understanding, that it was, therefore, necessary to write a completely new book. The book contains two principal novelties: first, a greatly improved treatment of the instinct-intelligence problems; secondly, the outline of a theory of the learning process."

Science News Letter, May 27, 1933

History

DICTIONARY OF UNITED STATES HISTORY—J. Franklin Jameson—*Historical Publishing Company,* 874 p., $9.50. A new revision of a famous work. From the time that Dr. Jameson's dictionary first appeared, it proved a really handy reference book, the alphabetic method of looking up facts being both direct and speedy. Since the World War, however, the need for a revision has been evident. While the dictionary is the main feature of the volume, several hundred pages are given to a chronology of 5,000 incidents in United States history and to various maps, important historic documents and other information. The new volume was edited under the supervision of Dr. Albert E. McKinley.

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Education

THE EDUCATIONAL FRONTIER—Edited by William H. Kilpatrick—*Century,* 325 p., $2.50. Although written by seven different educators, the book is not just a collection of separate essays but rather the result of cooperative effort. It is an analysis of the present educational situation with suggested remedies for existing evils, and it concludes with a chapter on "The Underlying Philosophy of Education."

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